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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/683,612	10/10/2003	Tzu-En Ho	10112981	1827
34283	7590	10/13/2005		
QUINTERO LAW OFFICE 1617 BROADWAY, 3RD FLOOR SANTA MONICA, CA 90404				
EXAMINER KENNEDY, JENNIFER M				
ART UNIT 2812				
PAPER NUMBER				

DATE MAILED: 10/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

<b>Office Action Summary</b>	<b>Application No.</b> 10/683,612	<b>Applicant(s)</b> HO ET AL.	
	<b>Examiner</b> Jennifer M. Kennedy	<b>Art Unit</b> 2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 01 August 2005.  
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.  
 4a) Of the above claim(s) 1-10 is/are withdrawn from consideration.  
 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
 6) ☒ Claim(s) 11-20 is/are rejected.  
 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☒ All b) ☐ Some \* c) ☐ None of:  
 1. ☒ Certified copies of the priority documents have been received.  
 2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/25/05, 5/5/05</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

Applicant's election of claims 11-20 in the reply filed on August 1, 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 1-10 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim.

### ***Response to Amendment***

In view of Applicants' amendment to the claim, the rejections of claim 6 and 16 under 35 U.S.C. 112 second paragraph, as being indefinite, are withdrawn.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 11, 16, 19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee (U.S. Patent No. 6,306,743).

In re claim 11, Lee et al. discloses the method including the steps of :

forming a polysilicon layer (24) overlying a substrate, insulated from the substrate by a dielectric layer (23);

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forming a metal-flash layer (25) overlying the polysilicon layer;  
forming a tungsten nitride layer (26) overlying the metal-flash layer; forming a tungsten layer (27) overlying the tungsten nitride layer;  
annealing the tungsten layer and the tungsten nitride layer using nitrogen gases (see column 3, line 63 through column 4, line 15); and  
forming a cap layer overlying the annealed tungsten layer (28).

In re claim 16, Lee discloses the method of forming a metal layer to be "approximately 100 angstroms" (see column 3, lines 55-60), which the examiner considers to be "about 30 Angstroms" as claimed.

In re claim 19, Lee discloses the method wherein the tungsten nitride layer is annealed at 800 to 1000°C (see column 4, lines 6-15).

In re claim 20, Lee discloses the method of annealing including annealing for 50 to 100 seconds (see column 4, lines 6-15).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (U.S. Patent No. 6, 306,743) in view of Cantell et al. (U.S. Patent No. 6,255,179).

Lee discloses the method as claimed and rejected above, but do not disclose the method of cleaning the surface of the polysilicon with a dilute HF acid. Cantell et al. disclose the method of cleaning the surface of the polysilicon with a dilute HF acid prior to the formation of a silicide layer (see column 4, lines 41-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to cleaning the surface of the polysilicon with a dilute HF acid prior to the formation of a silicide layer because it allows for the removal of contaminates.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (U.S. Patent No. 6, 306,743) in view of Youn et al. (U.S. Patent Appl. 2004/0238876).

Lee discloses the method as claimed and rejected above, but does not disclose the method wherein the metal flash layer is formed by self-aligned silicide process. Youn et al. disclose the method of wherein the metal flash layer is formed by self-aligned silicide process (see [0024]-[0025]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the metal flash layer by the method of Youn et al., because as Youn et al. teach, either a deposition process or a self-aligned silicide process may be utilized and interchangeable, however it is known in that a self-aligned silicide process requires further processing steps.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (U.S. Patent No. 6, 306,743) in view of Yang (U.S. Patent Appl. 2002/0074584).

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In re claim 17, Lee discloses the method of forming a metal flash layer of a metal silicide, including tungsten silicide, but do not disclose the method wherein the metal flashing layer comprises Ti, Co, or Ni. Yang discloses the method wherein the metal-flash layer comprises Ti, Co, or Ni (see [0033]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the metal flashing layer comprising Ti, Co, or Ni rather than the flashing layer comprising W, because as Yang teaches the Ti, Co, and Ni metals are interchangeable with W as refractory metals for a gate stack, all of which allow for lowered resistance.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (U.S. Patent No. 6, 306,743).

In re claim 18, Lee disclose the method of annealing wherein nitrogen and hydrogen are flowed, but do not disclose the method wherein the flow ratio of nitrogen to hydrogen is about 4:1 to 3:2. The examiner notes that Applicant does not teach that the flow ratio solves any stated problem or is for any particular purpose. Therefore, the flow ratio range lacks criticality in the claimed invention and does not produce unexpected or novel results. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the anneal at the ratio of nitrogen to hydrogen in a range of 4:1 to 3:2, since the invention would perform equally well when different flow ratios are utilized to create a improved reliability of the transistors, and because it has been held that where the general conditions of a claim are disclosed

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in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233, MPEP 2144.05 II A.

Claims 11, and 15-16, 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Youn et al. (U.S. Patent Appl. 2004/0238876) in view of Lee et al. (U.S. Patent No. 6,306,743).

In re claims 1 and 11, Youn et al. disclose the method including the steps of :  
forming a polysilicon layer (104) overlying a substrate, insulated from the substrate by a dielectric layer (102);

forming a metal-flash layer (106) overlying the polysilicon layer;

forming a tungsten nitride layer (108) overlying the metal-flash layer; and

forming a tungsten layer (110) overlying the tungsten nitride layer.

Youn et al. disclose the method of annealing the tungsten and the tungsten nitride layer utilizing nitrogen, but do not disclose the method wherein the tungsten and tungsten nitride layer are annealed using nitrogen and hydrogen gases, nor the method of forming a cap layer overlying the annealed tungsten layer. Lee discloses the method of annealing a tungsten and a tungsten nitride layer of a gate stack using nitrogen and hydrogen gases and forming the cap layer overlying the annealed tungsten layer (see column 3, line 60 through column 4, line 15). It would have been obvious to one of ordinary skill in the art at the time the invention was made to anneal the tungsten and tungsten nitride layer of Youn et al. with nitrogen and hydrogen because as Lee discloses the method improves the barrier characteristics of the WN layer.

In re claim 15, Youn et al. disclose the method of wherein the metal flash layer is formed by self-aligned silicide process (see [0024]-[0025]).

In re claim 16, Youn et al. disclose the method of forming a metal layer to be about "50 angstroms" (see [0025]), which the examiner considers to be "about 30 Angstroms" as claimed.

In re claim 19, Youn et al. disclose the method wherein the tungsten nitride layer is annealed at 800 to 1000°C (see Youn [0047]).

In re claim 18, the combined Youn et al. and Lee disclose the method of annealing wherein nitrogen to hydrogen are flowed, but do not disclose the method wherein the flow ratio of nitrogen to hydrogen is about 4:1 to 3:2. The examiner notes that Applicant does not teach that the flow ratio solves any stated problem or is for any particular purpose. Therefore, the flow ratio range lacks criticality in the claimed invention and does not produce unexpected or novel results. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the anneal at the ratio of nitrogen to hydrogen in a range of 4:1 to 3:2, since the invention would perform equally well when different flow ratios are utilized to create a improved reliability of the transistors, and because it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233, MPEP 2144.05 II A.



In re claim 20, the combined Youn et al. and Lee disclose the method of annealing including annealing for 50 to 100 seconds (see Lee column 4, lines 6-15).

Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Youn et al. (U.S. Patent Appl. 2004/0238876) and Lee (U.S. Patent No. 6,306,743) in view of Cantell et al. (U.S. Patent No. 6,255,179).

The combined Youn et al. and Yang disclose the method as claimed and rejected above, but do not disclose the method of cleaning the surface of the polysilicon with a dilute HF acid. Cantell et al. disclose the method of cleaning the surface of the polysilicon with a dilute HF acid prior to the formation of a silicide layer (see column 4, lines 41-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to cleaning the surface of the polysilicon with a dilute HF acid prior to the formation of a silicide layer because it allows for the removal of contaminates.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Youn et al. (U.S. Patent Appl. 2004/0238876) and Lee (U.S. Patent No. 6,306,743) in view of Yang (U.S. Patent Appl. 2002/0074584).

In re claims 17, Youn et al. and Lee disclose the method of forming a metal flash layer of a metal silicide, including tungsten silicide, but do not disclose the method wherein the metal flashing layer comprises Ti, Co, or Ni. Yang discloses the method wherein the metal-flash layer comprises Ti, Co, or Ni (see [0033]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the

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metal flashing layer comprising Ti, Co, or Ni rather than the flashing layer comprising W, because as Yang teaches the Ti, Co, and Ni metals are interchangeable with W as refractory metals for a gate stack, all of which allow for lowered resistance.

### ***Response to Arguments***

Applicant's arguments with respect to claims 11-20 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Kennedy whose telephone number is (571) 272-1672. The examiner can normally be reached on Mon.-Fri. 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Jennifer M. Kennedy  
Primary Examiner  
Art Unit 2812

jmk